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ABSTRACT

This study examined three potential situational determinants of children's question-asking: (1) the presence or absence of a peer; (2) whether or not the children are given tactual access to the materials being used to induce questions; and (3) whether these materials are presented three-dimensionally (as objects) or two-dimensionally (as photographs of objects). Thirty-six children, ranging from 46 to 67 months of age, were invited to look at a set of stimulus materials (e.g., biological specimens and household implements). Half of the children examined the materials with a peer and half did so alone. One-third of the children in each peer condition were presented the materials as objects that they were free to touch, one-third as objects that they could not touch, and one-third as life-size photographs of the objects. Two types of questions asked by the children about the stimuli were analyzed: (1) identification questions (viz., questions concerning the objects' names) and (2) transformational questions (viz., questions involving broader speculations about the objects such as their origin, function, etc.). Results revealed that the children asked significantly fewer identification questions when with a peer than when alone. The children who could touch the objects asked the most transformational questions; those who could not touch the objects asked the next most; and those shown photos of the objects asked the least. (Author/SB)

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Peer Presence, Tactual Access and Stimulus Dimensionality as Situational Determinants of Young Children's Questioning Behavior

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Running Head: Situational Determinants of Questioning Behavior

Abstract

Thirty-six children, ranging from 46 to 67 months of age, were invited to look at a set of stimulus materials (e.g., biological specimans and household implements). Half of the children examined the materials with a peer and half did so alone. Further, one-third of the children in each peer condition were presented the materials as objects that they were free to touch, one-third as objects that they could not touch and one-third as life-size photographs of the objects. Two types of questions asked by the children about the stimuli were analyzed: 1) identification questions (viz., questions concerning the objects' names) and 2) transformational questions (viz., questions involving broader speculations about the objects such as their origin, function, etc.). Results revealed that the children asked significantly fewer identification questions when with a peer than when alone. Further, the children who could touch the objects asked the most transformational questions, while those who could not touch the objects asked the next most and those shown photos of the objects asked the least.

Peer Presence; Tactual Access and Stimlus Dimensionality as Situational Determinants of Young Children's Questioning Behavior

Substantial differences from study to study in the frequency with which young children ask questions about novel stimuli has led the present author to conclude that question-asking is a rather "delicate" behavior that is powerfully affected by situational factors (e.g., Endsley & Clarey, 1975). Therefore, three potential situational determinants of question-asking were examined in the present study: 1) the presence or absence of a peer; 2) whether or not children are given tactual access to the materials being used to induce questions; and 3) whether these materials are presented three-dimensionally (as objects) or two-dimensionally (as photographs of objects).

Peer Presence

Endsley and Gupta (note 1) recently found that the number of questions asked per child was strongly influenced by the number of children present. Specifically, preschool children asked the most questions of their teacher when alone with her, the next most when a peer was also present, and the least when three other peers were also present. On the other hand, the groups of two children asked more questions as a group than did the groups of four children or than the individual children when alone.

Unfortunately, since Endsley and Gupta used a within-subjects design in which the two-child group condition was confounded with the order of presenting all three group size conditions, findings regarding the dyadic condition must be treated with some caution. Accordingly, the first purpose in the present study was to re-examine, using a between-subjects design, the number of questions asked on both a per child and a per group basis

when children are with a peer or alone. Given the Endsley-Gupta findings, it was predicted that individual children would ask more questions when alone than when with a peer (prediction 1). On the other hand, it was also predicted that two children together would ask more questions in total than would individual children tested alone (prediction 2).

Tactual Access

Torrance (1970) also found that small groups of kindergarten children, while gathered around a table to inspect a novel toy, asked more questions about the toy when they were free to touch it than when their teacher asked them not to do so. Using a younger and smaller sample (16 preschool boys), sets of six non-toy stimuli (e.g., biological artifacts, household items, etc.) and testing the children in individual sessions, Mathieu (note 2) obtained results somewhat similar to those found by Torrance. That is, her no-touch group asked fewer questions than the touch group, though the difference disappeared over successive sessions (even though novelty of the materials was held constant).

Mathieu prevented her children from touching the experimental objects by presenting them in a box covered with a piece of clear plastic. One (probably minor) methodological problem in her study was that the objects were presented in a box only in the no-touch condition. Thus, it is possible that the box itself, rather than the cover, somehow temporarily inhibited the children's questions. Therefore, the second purpose of the present study was to replicate the Mathieu procedure and findings, but with a larger preschool sample of both boys and girls, and using a stimulus presentation procedure that eliminated the possible "box effect." Specifically, it was predicted that the children prevented from touching a set of stimulus

materials would ask fewer questions about those materials than would children who were free to touch them (prediction 3). Further, on intuitive grounds it was expected that the inhibiting effect of not being able to touch materials would operate on the children, regardless of whether they were tested individually or with a peer (prediction 4).

Stimulus Dimensionality

The predictions made regarding the first two situational variables were based essentially on rather direct extrapolations of the findings from previous research. However, in lieu of available research, predictions concerning the relative effects on question-asking of presenting concrete objects as compared to photographs of objects were developed on more rational grounds. Specifically, it was predicted that the children would also ask fewer questions about photographs of objects than about the objects themselves that they were free to touch (prediction 5). This prediction was based on the previous hypothesis that tactual inaccessibility inhibits questions, and on the assumption that by its nature an object in a photograph is not itself manipulable. Again on intuitive grounds, it was expected that the presumed inhibiting influence of photos on questions would operate on children tested alone as well as on those with a peer present (prediction 6).

Using the manipulability argument, of course, provided no clear basis for predicting whether photographs of objects would generate as many questions as would actual objects that were tactually inaccessible. The author frankly had no clear-cut expectations about the relative inhibiting effects that these two conditions might have on children's questions.

Children's Questions

The previous discussion and literature cited has emphasized the frequency with which children ask questions about novel stimulus materials, regardless

of the type of question asked. However, following a recent theoretical analysis of exploratory behavior (Nunnally and Lemond, 1973), the questions asked by children in the present study were subdivided into two categories in order to index two encoding (collative) phases of cognitive functioning presumably operating as children encounter new stimulus materials.

Briefly, Nunnally and Lemond suggest that there is a predictable cycle of cognitive activities and parallel exploratory behaviors that occur when an organism encounters a novel stimulus. Specifically, they suggest that attention is first drawn to a stimulus, followed by two phases of cognitive encoding: 1) phase one, consisting of identifying the stimulus (e.g., attempting to answer the question, "What is it?"); and 2) phase two, consisting of broader speculations or transformational thinking about the stimulus (e.g., attempting to answer questions about other details of the stimulus, its function, origin, etc.).

Questions regarding the identification of an item (identification questions) and questions regarding further speculations about an item (transformational questions) were therefore analyzed separately in order to examine the extent to which the situational variables under investigation influenced the two encoding phases referred to by Nunnally and Lemond. While it is not entirely clear from their analysis (see figure 1 and text, pp. 63-65), Nunnally and Lemond seem to be suggesting that manipulation of a (three-dimensional) stimulus plays a more extensive role during phase two encoding than phase one encoding. Accordingly, the final prediction in the present study was that the situational factors which limited the children's tactual access to the materials would reduce transformational questions more than identification questions (prediction 7).

Method

Subjects

Thirty-six children attending either a half day or full day preschool program, 24 girls and 12 boys with a mean age of 57 months and an age range of 46-67 months, served as subjects. With few exceptions, the children were from white, professionally oriented, two-parent families. For example, over two-thirds of the fathers were affiliated with the local university as faculty or as graduate students. Teacher judgements and partial records from the Metropolitan Achievement Test and the Picture Peabody Vocabulary Test indicated that all of the children were of at least average intelligence.

Stimulus Materials

Twelve objects were initially selected from a larger set of items which in previous research (Endsley and Clarey, 1975; Endsley and Gupta, note 1; Mathieu, note 2) had proven effective in eliciting questions from young children. The objects included a variety of small household implements and biological specimans that possessed moving parts, interesting textural qualities, and/or were not generally familiar to young children. Eight adults independently evaluated 7 X 9 inch colored photographs of the 12 objects in terms of how well each represented the three-dimensional form of an object in actual color, size and sharpness of detail. Based on their judgements, the following set of six items were retained for presentation: 1) a preserved turtle in a jar; 2) a stuffed squirrel; 3) a fishing reel; 4) a manually operated french fry cutter missing the cutting unit; 5) a manually operated knife sharpener composed of small rotating metal discs; and 6) a metal shoe stretcher.

Design

Eight girls and four boys were randomly assigned to each of the three stimulus presentation conditions described below:

1) Object-Touch--children were presented the set of six three-dimensional objects described previously in a 61 centimeter by 61 centimeter by 10 centimeter wooden box, the top side of which was open, thereby permitting access to the objects. The objects were arrayed in two rows of three, and the same arrangement was used for each session.

2) Object-No Touch--children were presented the same set of objects in the box, but the top was covered with a sheet of clear plastic which was securely tacked to the sides to prevent the children from touching the objects.

3) Photo--children were presented the colored photographs of the six objects mounted on a 61 centimeter X 61 centimeter wooden board in the same configuration as the objects were arranged in the box.

Half of the children within each of the stimulus presentation conditions were randomly assigned to view the materials in same-sex pairs (peer presence), while the remaining children viewed the materials alone (peer absence).

Procedure

The children were invited to "play a game" with the experimenter, a white female graduate student in her twenties, in an experimental room near the children's playroom. Upon entering the room, the children were asked to sit on the floor next to the covered stimulus materials. The experimenter then uncovered the materials and invited the children to look at them.

The experimenter attempted to provide a brief but informative answer to each question by the children. A check on two tapes selected randomly from each of the six experimental subgroups revealed that she was able to provide informative answers (e.g., say something other than "I don't know") to 89 percent of the questions. More importantly, her percentage of informative replies was virtually the same in all conditions (i.e., 89 percent in both

peer presence and peer absence, and 88-91 percent in the three presentation mode conditions).

Each session lasted a maximum of six minutes, but was terminated earlier if the children indicated that they wanted to return to their classroom. Sessions involving all but 11 of the children lasted the full six minutes. The time spent in session by the 11 "early terminators" averaged 4.2 minutes and ranged from 2.5 to 5.8 minutes. Nine of the "early terminators" were in the peer absence condition; two of these were in the object-touch group, three in the object-no touch group and four in the photo group. The remaining two "early terminators" in the peer presence condition were also in the photo group.

Dependent Measures

The audio portion of each session was taped, 27 with a video recorder (thereby providing a visual record as well) and nine with a cassette recorder, by an observer who operated the recording equipment from an adjoining booth which contained one-way glass. The observer-operator supplemented and clarified the tape recordings by taking on-the-spot notes of the question-answer exchanges.

A question was defined as a sentence or phrase uttered in the interrogative form, as well as inflected statements which involved requests for information. Questions asked about anything other than the experimental materials were not included in the data under analysis. Further, the data did not include any questions which reflected the children's attempt to secure permission to perform some action with the materials (e.g., "Can I take this back to my room?"). They also did not include any repeat questions (i.e., questions that had already been asked in substantially the same form by the children or their peers that were present in the session and which had been answered by the experimenter.

The data were reliably scored, as indicated by the fact that the r between the number of questions that the observer and a second rater independently scored from the tapes for each minute of seven randomly selected sessions involving nine children was .95, $p < .01$. Further, the second rater agreed with the observer's judgements about whether a question was an identification type or a transformational type on 96 percent of the questions scored from these seven session.

Results

The mean number of identification and transformational questions asked per child and per session in the six experimental subgroups are presented in Table 1. Separate two-way analysis of variance were performed on each

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Insert Table 1 About Here

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type of question, in which the main effects were Peer Condition (peer present, peer absent) and Presentation Mode (object-touch, object-no touch, photo). In case of the analysis employing questions per session rather than per child, the least-squares solution was employed since, of course, only half as many sessions were involved for the 18 children who participated with a peer than for the 18 who participated without a peer (Winer, 1962, p. 291). The Newman-Keuls procedure was also used in all follow-up tests of significant main effects involving Presentation Mode.

Effects of Peer Presence

Confirming prediction 1, the children who were presented the experimental materials alone asked significantly more identification questions than did the children who had a peer present, F (1/30) = 6.95, $p < .05$. However, while the same trend appeared to be equally evident among the transformational question means (see Table 1), the main effect of Peer Condition was not significant.

The data presented in Table 1, especially that for the object-touch condition, also appeared to support prediction 2 that two children together would ask more questions than children tested without the presence of a peer (see instructions given in footnote a for making per session comparisons). However, regardless of type of question, results of the least squares analysis of variance revealed that this trend (supportive of prediction 2) was not significant.

Effects of Tactual Access and Stimulus Dimensionality

As indicated in Table 1, the results for transformational questions appeared to provide support for predictions 3-6 which concerned the inhibiting influence on questions of not being able to touch the objects for both children tested with and without a peer. Specifically, the main effect of Presentation Mode was significant in the case of transformational questions, F (1/30) = 8.15, p .01, but not for identification questions. Confirming the trends noted in Table 1, follow-up analysis of the significant Presentation Mode effect revealed that both the object-no touch and photo groups asked significantly fewer transformational questions than did the object-touch group (both p's $<$.01). While not predicted, it was also interesting to find that the photo group asked significantly fewer transformational questions than did the object-no touch group (p .05).

Finally, the preceding evidence that the Presentation Mode conditions influenced the number of transformational questions but not the number of identification questions supports prediction 7 that the situational factors which limited tactual access to the objects (object-no touch and photo conditions) would reduce the former questions more than the latter. In fact as indicated in Table 1, the identification question means for children in the three Presentation Mode conditions were highly similar, while in the

case of transformational questions, object-touch children asked more than twice as many as the object-no touch children, and almost seven times as many as the photo children.

Discussion

Peer Presence Effects

In supporting prediction 1, the per child data replicated the Endsley-Gupta findings (note 1) that children ask more questions when alone with an adult than when a peer is also present. Furthermore, the present study extends the Endsley-Gupta findings in demonstrating that the peer presence effect also operates when the stimulus materials are not available to touch. However, while the peer presence effect appeared to exist both with identification and transformational questions, it was statistically reliable only in the former case. Further research is needed to determine if the presence of a peer influences only identification encoding activity or transformational encoding activity as well.

Turning to the per session data relevant to prediction 2, the means were in the predicted direction (see Table 1); however, there was no statistically reliable evidence that two children together generated more questions than did individual children without a peer. Still, inspection of the data in the object-touch condition yielded a pattern of performance similar to that found by Endsley and Gupta (note 1) using the same condition. Extrapolation from the two studies suggests that an individual child alone with objects he/she is free to touch may ask about two-thirds as many questions as will two children combined who are examining the materials together. If further research using a more robust N can demonstrate with statistical confidence a differences of this magnitude, it would have both theoretical and practical

implications (see Endsley and Gupta for a discussion of the psychological and educational meaningfulness of using both a per child measure and a per session measure of question-asking in studies concerning the effects of group size).

Tactual Access and Stimulus Dimensionality Effects

The findings clearly revealed that the children asked more transformational questions about objects that were available to touch than about objects that were unavailable to touch (prediction 3) or photographs of the same objects (prediction 5). Further, the findings revealed that the children's transformational questions were reduced by the no-touch and photo conditions, regardless of whether they were alone or with a peer (predictions 4 and 6).

It remains to be seen to what extent the obtained relationships will hold with other stimulus materials or with children having substantially different characteristics and prior experiences than those in the present study. Nevertheless, the findings do appear to be congruent with the Piagetian view concerning the importance of sensory-motor involvement with the environment as a means by which cognitive structures originate and are maintained (Ginsburg and Opper, 1969).

The findings also parallel a growing number of studies in the attention literature which reveal that three-dimensional materials, especially those that children are free to handle, are more readily matched, discriminated and remembered than are two-dimensional materials (Pick, Frankel and Hess, 1975). Among other issues, it would seem useful in future research to explore the manner and extent to which questions, particularly transformational ones involving broader speculations about stimuli, enhance children's ability to match, discriminate and remember such stimuli.

As mentioned previously, it was also interesting to find that children in the photo condition asked significantly fewer transformational questions than did the children in the object-no touch condition. We had assumed that the object-no touch and photo conditions each eliminated the children's opportunity to tactually explore the objects. Given the present findings and still in line with the sensory-motor involvement hypothesis, we have speculated further that the photo condition also restricted more than did the object-no touch condition the children's opportunity to visually explore the items. This speculation seems reasonable since regardless of what angle one looks at a photo, the same view (information) is presented. On the other hand, through appropriate postural-receptor adjustments, several different perspectives of objects presented in a box are possible.

The plausibility of this line of reasoning was supported in the data obtained from further analysis of the video tape records available for 10 children in the object-touch condition and 10 in the photo condition. Two easily observable measures of the change in postural adjustments made by the children as they examined the objects or photos were obtained: the number of 10-second intervals during the session in which the child
1) bent to within 10 inches of an object or photo to inspect it, and
2) moved to another side of the box or board for a different view of the materials. By both measures the object-touch children engaged in more postural adjustments than did the photo children; significantly so in the case of bending close, t (18) = 90.3, $p < .01$ ($\bar{X}$'s = 3.9 and .1 for object-touch and photo groups, respectively); and nonsignificantly so in the case of moving to a different side, t (18) = 1.65, $p < .07$ ($\bar{X}$'s = 2.2 and .3, respectively).

Further analysis of the children's video and audio records in the object-no touch condition also supported a contention by Mathieu (Note 2) that this condition inhibits questioning, though only temporarily, due to the competition of barrier-circumventing behaviors aroused by the frustration of not being able to touch the objects. Specifically, nine of the 12 children in the object-no touch condition made one or more comments concerned with removing the clear plastic cover ($\bar{X}$ = 4.1 comments), and four of the 10 children on whom video records are available made rather energetic efforts to poke through the cover or otherwise remove it.

Mathieu developed her frustration-competition hypothesis as a means of explaining why the inhibiting influence on questions produced by preventing the children from touching the objects disappeared by the third of five brief sessions spread over approximately three weeks. Briefly, she argued that frustration-produced barrier behaviors detracted from questioning largely during the first two sessions because the children initially expected to be able to touch the objects and spent a large portion of their time during the sessions in trying to do so. However, with continuing sessions where the rule of not touching the objects was consistently imposed, the frustration was supposedly decreasing since the expectations of touching the objects were also decreasing (Endsley, 1967).

While a frustration-competation hypothesis appears to receive support from the barrier behavior of the present children in the object-no touch condition, there was little evidence that the children in the photo condition were similarly frustrated. Rather, their behavior might better be described as reflecting boredom in having only six pictures to look at. Many of these children spent only a few moments in examining the photos, and typically wanted to know what else they were going to do. Their greater boredom with

the task was also reflected in the fact that, as noted previously (see Method), more children terminated their sessions in the photo condition than in the other two conditions combined.

Nevertheless, the question remains as to whether the photo condition, as perhaps the no-touch condition if Mathieu's data are replicable, would produce only temporary or more enduring inhibition of young children's questioning activity across sessions. If handling materials is indeed fundamental to young children's transformational thinking, then decrements in such questions should remain over several sessions involving different but comparably novel materials. On the other hand, if disruption in transformational encoding activity is largely the product of competing behaviors aroused by failing to provide children with accustomed modes of interacting with materials, then such disruption might be expected to decrease over sessions.

Effects on Identification and Transformational Questions

The findings clearly supported prediction 7 that transformational questions would be more disrupted by the objects' tactual inaccessibility than would identification questions. In postulating that tactual manipulation begins at the end of phase one encoding (identification phase) and before the beginning of phase two encoding (transformational thinking phase), it should be noted that Nunnally and Lemond restricted their analysis to describing a cycle of observable nonverbal exploratory behaviors. Further, they seem to imply that these overt behaviors are indicants of covert cognitive processes rather than determinants or consequences of them. Nevertheless, it is reasonable to suggest that various patterns of overt verbal and nonverbal information-seeking behaviors as well as other covert mental operations, also conceived to be responses, are all organized into chains and habit-family

hierarchies of information-collating activity (Berlyne, 1965). Conceived in this way, disruption of one response element (such as tactual exploration) in these chains should (at least temporarily) disrupt other elements (such as questions) in these chains.

Finally, Nunnally and Lemond do not explain why they think that manipulative activity generally comes at the end of the identifaction encoding phase and prior to the transformational phase. Nevertheless, congruent with Piaget's developmental conception of internalyzing sensory-motor schemes, they suggest that tactual exploration during both encoding phases would become forshortened with age (p. 103). Based on Piaget's internalization concept, we would also predict that (below the preschool period) the younger the child, the earlier in the identification phase would tactual exploration occur, and therefore the more disruptive would tactual inaccessibility be to their asking identification questions. On the other hand, with an increase in age beyond the preschool period, transformational questions, at least of the variety asked by the present children (e.g., function, origin of objects) would be less disrupted by restrictions or tactual exploration. Of course, only further research will reveal the validity of these predictions.

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Reference Notes

1. Endsley, R. C. & Gupta, S. Group size as a determinant of preschool children's frequency of asking questions. Manuscript submitted for publication, 1976.

2. Mathieu, J. M. Opportunity to manipulate and age as determinants of young children's question-asking. Unpublished master's thesis, University of Georgia, 1972.

Table 1

Mean Number of Identification and Transformational Questions Asked by Children in the Six Experimental Conditions

Experimental Group	Type of Question	
	Identification	Transformational
Object-Touch		
Peer Presence	2.7	7.7
Peer Absence	3.7	9.5
Combined	3.2	8.6
Object-No Touch		
Peer Presence	1.8	2.7
Peer Absence	4.8	4.7
Combined	3.3	3.7
Photo		
Peer Presence	2.5	.5
Peer Absence	3.7	2.0
Combined	3.1	1.3

[a]For purposes of evaluating the evidence for prediction 2, the means per session may be obtained by simply multipling by two the mean per child values presented in the peer presence conditions, and compare those to the means for peer absence given in the table.